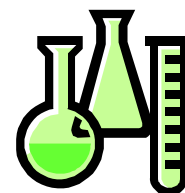
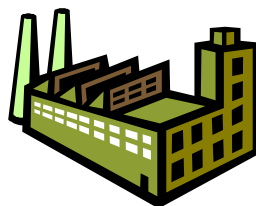




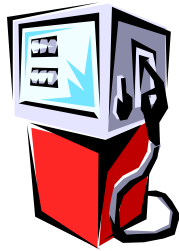
Fuel for Fleets and Economic Growth



***Clean Cities Conference
Washington, DC
June 1998***

Innovative Fuel Products

Made from renewable materials



Alternative fuels and gasoline blends



Diesel blends



Gasoline oxygenates



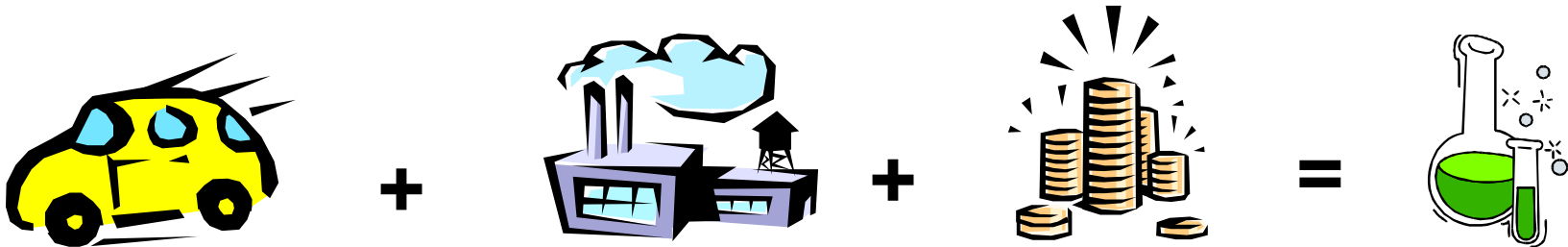
Related additives

P-Series: Good for Fleets

<i>Fuel:</i>	<i>Liquid alternative motor fuel (patented)</i> <i>Uses E-85/M-85 spec distribution equipment</i>
<i>Vehicles:</i>	<i>Light duty, spark ignited</i> <i>Flexible Fuel Vehicles (FFV)</i>
<i>Performance:</i>	<i>Lower emissions</i> <i>More horsepower</i> <i>Cold weather starts</i>
<i>Economics:</i>	<i>Fuel <u>competitive with gasoline</u></i> <i>No extra cost for FFVs</i>
<i>EPACT:</i>	<i>“Alternative Fuel” designation pending</i>
<i>Availability:</i>	<i><u>Now</u> for demonstration programs</i> <i>Two-year lead time for prod. plants</i>

Engineered Fuels Concept

Formulating complex blends to meet performance objectives



**Performance
Characteristics**

**Production
Systems**

Economics

P-Series Fuel

***Objectives: design a new alternative fuel
for use in light duty vehicles (SI engines)***

- **Consistent with EPACT**
 - Non petroleum
 - Energy security
 - Environmental benefits
- **Compatible with CAAA**
- **Uses existing vehicles and infrastructure**
- **Renewable**
- **Economically competitive**



P-Series Fuel

Process: engineering the formulation

	BTU	Octane	RVP	Cost	Renewable
Ethanol		★			★
Pentanes +	★			★	
Co-solvent			★		★
P-Series	★	★	★	★	★



P-Series Fuel

Result: high performance patented motor fuel*



- Easy to use liquid
- Miscible with gasoline
- Runs in “no extra cost” FFVs
- To be produced via integrated system
- Feedstock sourced locally
- Favorable health and safety profile
- Good biodegradation

* Pure Energy is exclusive worldwide licensee from Princeton University. US patent 5,697,987

P-Series Fuel

*Result: compelling
characteristics*

	P-Series	Gasoline
BTU/gal	~100,000	112,000-115,000
(R+M)/2	up to 97	up to 94
RVP	6.8 +	6.8 +
Sulfur	<9 ppm	100-300+ ppm
Cost	Competitive	



P-Series

Result: Lower emissions

P-Series outperformed CA II RFG in FTP and US06 tests in Ford Taurus E-85 FFV's

vs. CA II RFG

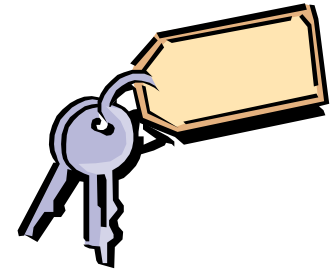
Hydrocarbons	↓ 30% - 70%
Ozone forming potential	↓ 40% - 60%
Total toxics	↓ 40% - 80%
Life cycle greenhouse gases	↓ 50% - 70%



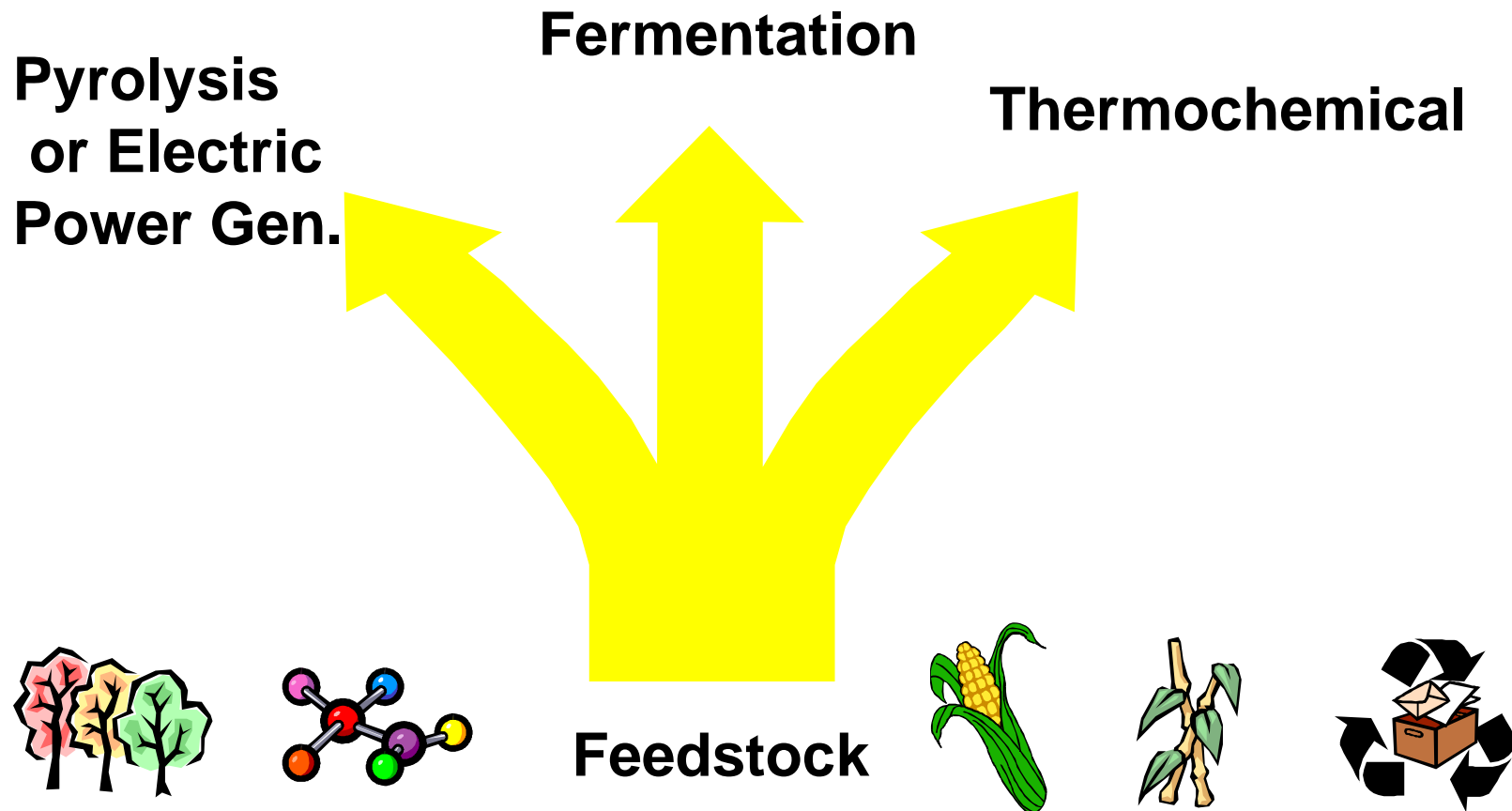
P-Series

Current Activities

- **Seeking fleets for demonstrations**
- **Designing commercial scale plants**
- **Structuring distribution agreements**
- **Locating strategic partners**
- **Completing government compliance**
- **Performing additional vehicle testing**



Integrated Production of Fuels & Chemicals

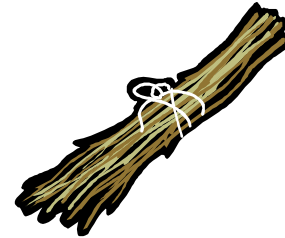


Ligno-cellulosic Feedstock

Flexibility to use many feedstocks

Agricultural wastes & crops

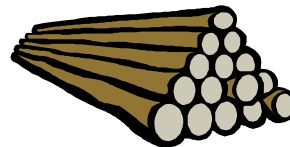
Rice straw, corn stover
bagasse, grasses



Municipal wastes
paper, cardboard
const/demo wood

Industrial wastes

wood chips, pallets
sawdust



Chemicals

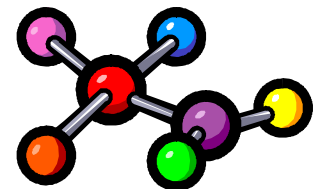
- **Environmentally friendlier production techniques**
- **Competitive production costs**
- **Potential new uses from lower price points and/or greater availability**
- **Use existing distribution channels**



Chemicals

Products, co-products and by-products

- **Alcohols**
- **Solvents**
- **Carboxylic acids**
- **Lignin-based chemicals**
- **Esters & ester salts**
- **Organic acids**
- **Plasticizers**



Contacts

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